

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference 1546P01PC	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/CA2005/000096	International filing date (day/month/year) 27 January 2005 (27-01-2005)	Priority date (day/month/year) 29 January 2004 (29-01-2004)	
International Patent Classification (IPC) or national classification and IPC IPC: F04B 9/107 (2006.01) , F04B 47/10 (2006.01)			
Applicant MCNICHOL, RICHARD FREDERICK ET AL			
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of <u>7</u> sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. <input checked="" type="checkbox"/> (sent to the applicant and to the International Bureau) a total of <u>5</u> sheets, as follows: <input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input checked="" type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. 1 and the Supplemental Box. b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions). 4. This report contains indications relating to the following items: <input checked="" type="checkbox"/> Box No. I Basis of the report <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input checked="" type="checkbox"/> Box No. VII Certain defects in the international application <input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application			
Date of submission of the demand 28 November 2005 (28-11-2005)		Date of completion of this report 4 May 2006 (04-05-2006)	
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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/CA2005/000096**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on:
- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of:
- ☐ international search (Rules 12.3(a) and 23.1(b))
- ☐ publication of the international application (Rule 12.4(a))
- ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))
2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:
- ☐ the international application as originally filed/furnished
- ☒ the description:
- ☒ pages 1 - 27 as originally filed/furnished
- ☐ pages* received by this Authority on _____
- ☐ pages* received by this Authority on _____
- ☒ the claims:
- ☐ pages as originally filed/furnished
- ☐ pages* as amended (together with any statement) under Article 19
- ☒ pages* 28-31, 31a received by this Authority on 28 November 2005 (28-11-2005)
- ☐ pages* received by this Authority on _____
- ☒ the drawings:
- ☒ pages 1-7 as originally filed/furnished
- ☐ pages* received by this Authority on _____
- ☐ pages* received by this Authority on _____
- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.
3. ☒ The amendments have resulted in the cancellation of:
- ☐ the description, pages _____
- ☒ the claims, Nos. 1-20
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to sequence listing (*specify*): _____
4. ☒ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages _____
- ☒ the claims, Nos. 4 - 11
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/CA2005/000096**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	<u>1 - 3</u>	YES
	Claims	<u>NONE</u>	NO
Inventive step (IS)	Claims	<u>1 - 3</u>	YES
	Claims	<u>NONE</u>	NO
Industrial applicability (IA)	Claims	<u>1 - 3</u>	YES
	Claims	<u>NONE</u>	NO

2. Citations and explanations (Rule 70.7)

Reference is made to the following documents:

D1: US 1,616,774 B (WARREN, JAMES A.) 8 FEBRUARY 1927 (08-02-1927)

D2: US 3,135,210 B (ENGLISH, CHARLES L.) 2 JUNE 1964 (02-06-1964)

Novelty (N)

Claims 1 to 3 comply with **PCT Article 33(2)**. Document D1 is considered to be the most relevant state of the art for claims 1 to 3. Document D1 discloses a pumping mechanism and system comprising:

- a piston cylinder (22) having a top and bottom
- first aperture at the bottom of the pump barrel (10)
- first liquid port (30) in the top wall of the cylinder (22)
- second liquid port (29) in the lower wall of the cylinder (22)
- piston (23) reciprocatingly mounted within the cylinder (22) having an area against which pressurized fluid acts in the direction of movement of the piston (23),
- a hollow plunger connected to the piston (23) and extending below the piston and slidably and sealingly through the first aperture
- inlet chamber (11) below the piston cylinder (22), the hollow plunger extending into the inlet chamber (11)
- inlet opening (12) in the inlet chamber (11) for the inflow of the liquid to be pumped
- hollow plunger having a smaller area within the inlet chamber than the area of the piston (23)
- first ball check valve (27) located in the passage through hollow plunger end (24)
- passage through hollow plunger end (24) for liquid communicating with inlet chamber (11)
- second check valve (14) in the inlet opening (12)
- means for pressurizing the volume of fluid during the recovery stroke, whereby the potential energy of the pressurized volume of fluid can be converted to kinetic energy to assist in raising the piston on subsequent pumping strokes

Document D1 does not disclose the features:

- the pump is a centrifugal pump
- second bottom passageway at the bottom of the cylinder
- a first conduit connected to the second bottom passageway and to the pump
- a second conduit connected to the first bottom passageway and to the body of liquid
- a pressure release valve adjacent to the first bottom passageway

See Supplemental Box for further details

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Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

The drawings and/or description do not comply with **PCT Rule 11.13(I)**. Reference signs not mentioned in the description shall not appear in the drawings, and vice versa. In particular, the reference character "20.1" (page 9, line 4) is not shown in the drawings.

The drawings and description do not comply with **PCT Rule 11.13(m)**. The same features, when denoted by reference signs, shall, throughout the entire application, be denoted by the same signs. The defects are discussed below:

In the description, the "chamber 90" (page 6, line 6) is located "in the cylinder 26 below the piston 40" (page 6, lines 6 and 7). Furthermore, the description describes liquid passing "from the cylinder 102 downwardly through the column 92, through the second passageway 34 into chamber 90 where it acts upwardly against the bottom of piston 40" (page 6, lines 28 to 30). However, in the drawings, the reference character "90" (Fig. 1) is shown inside the annular jacket "96" and outside the cylinder "26".

The reference character "41.2" (two features in Fig. 6A and Fig. 6b) is described by two different features, the "surface area 41.2" (page 21, line 26) and "a first one-way valve, indicated generally by reference numeral 41.2" (page 22, line 8), in the description.

In view of the above, the same features should be denoted by the same reference signs throughout the entire application.

Box No. VIII **Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

The description does not comply with **PCT Article 5**. A statement in an application, such as found on page 5, lines 5 and 6, which incorporates by reference any other document does not fully describe the invention. The description shall be complete in and on itself. A person skilled in the art should be able to understand the patent specifications without reference to any other document.

Claim 1 does not comply with **PCT Article 6**. The inclusion of "sixth passageway" (claim 1, line 14, page 29) causes a lack of clarity because only four passageways were previously defined and the inclusion of the aforementioned term implies the presence of a "fifth passageway".

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box I. 4.

Regarding PCT Rule 70.2(c), the following are the reasons why the amended claims 4 to 11 goes beyond the disclosure in the international application as originally filed.

First, claims 4 to 11 contain new subject matter. The feature of "means for pressurizing the *volume of fluid* during the recovery stroke" (claim 4, line 9, page 30; and claim 11, line 1, page 31a), where the *volume of fluid* is "in the cylinder under the piston" (claim 4, line 6, page 30), is broader than the original application disclosure because the description only teaches the application of the piston weight, fluid weight or pressurized fluid above the piston to pressurize a volume of fluid in a means for storing pressurized liquid from below the piston during the recovery stroke.

Second, claims 4 to 11 are broader in scope than the teaching of the description. Claims 4 to 11 must include the feature "means for storing pressurized liquid connected to the second passageway for storing pressurized liquid displaced from below the piston, as the piston moves downwardly, and to assist in raising the piston and, accordingly, liquid contained within the piston rod, to pump liquid upwardly and through the first passageway" (page 2, line 28 to page 3, line 2). The description teaches this feature is required for the apparatus to allow "the use of a pump which requires far less energy input to pump liquids up significant vertical distances because it converts the potential energy of the standing column into kinetic energy" (page 3, lines 17 to 19).

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box No. V

Document D2 discloses a hydraulic pressure booster including

- fluid pressure operated engine pistons
- engine piston areas for alternately receiving the impress of power fluid during operating of the booster
- pumping means connected to the engine pistons to pump a pressurized fluid
- the pumping means being a centrifugal pump

The subject-matter of claim 1 differs from the hydraulic pressure booster described in D2 in that the hydraulic pressure booster does not have a hollow piston rod.

Therefore, claims 1 to 3 comply with **PCT Article 33(2)**.

Inventive Step (IS)

Claims 1 to 3 comply with **PCT Article 33(3)**. Claims 1 to 3 are considered to involve an inventive step since, having regard to the prior art, it is not, at the prescribed relevant date, obvious to a person skilled in the art.

Industrial Applicability (IA)

The subject matter of claims 1 to 3 is considered to be industrially applicable and thus fulfills the requirements of **PCT Article 33(4)**.

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WHAT IS CLAIMED IS:

1. A piston type pumping apparatus, comprising:

5

a vertically oriented cylinder having a top and a bottom, the bottom having a first aperture;

10

a first passageway for liquid in the cylinder at the top thereof;

a second passageway for liquid in the cylinder at the bottom thereof;

15

a piston reciprocatingly mounted within the cylinder and having an area against which pressurized fluid acts in the direction of movement of the piston;

a hollow piston rod connected to the piston and extending below the piston and slidably and sealingly through the first aperture in the bottom of the cylinder;

20

a reload chamber below the cylinder, the piston rod extending slidably and sealingly into the reload chamber and having a third passageway for liquid communicating with the reload chamber, the piston rod having a smaller area within the reload chamber upon which pressurized fluid in the reload chamber acts in a direction of movement of the piston and piston rod compared to said area of the piston;

25

a first one-way valve located in the third passageway which permits liquid to flow from the reload chamber into and above the piston rod and prevents liquid from flowing back through the piston rod into the reload chamber;

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a fourth passageway for liquid extending from the reload chamber to a source of liquid to be pumped;

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a second one-way valve in the fourth passageway which permits liquid to flow from the source of liquid into the reload chamber and prevents liquid from flowing from the reload chamber towards the source of liquid;

5 means for storing pressurized liquid connected to the second passageway for storing pressurized liquid displaced below the piston, as the piston moves downwardly, and to assist in raising the piston and, accordingly, liquid contained within the piston rod, to pump liquid upwardly and through the first passageway, said means for storing including a body of liquid;

10 a centrifugal pump connected to the body of liquid for pumping liquid into the cylinder below the piston to raise the piston;

a sixth passageway for liquid adjacent to the bottom of the cylinder;

15 a first conduit connecting the sixth passageway to the centrifugal pump; and

a second conduit connecting the second passageway to the body of liquid.

20 2. The apparatus of claim 1, wherein the body of liquid is a receiver.

3. The apparatus of claim 2, including a pressure release valve adjacent to the second passageway in the second conduit.

25 4. A piston type pumping apparatus, comprising:

a vertically oriented cylinder having a top and a bottom, the bottom having a first aperture;

30 a first passageway for liquid in the cylinder at the top thereof;

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a second passageway for liquid in the cylinder at the bottom thereof;

5 a piston reciprocatingly mounted within the cylinder and having an area against which pressurized fluid acts in the direction of movement of the piston, whereby the pressurized fluid raises the piston in the cylinder during a pumping stroke thereby forming a volume of fluid in the cylinder under the piston, and the piston acts on the volume of fluid thereunder during a recovery stroke;

10 means for pressurizing the volume of fluid during the recovery stroke, whereby the pressurized volume of fluid can be converted to kinetic energy to assist in raising the piston on subsequent pumping strokes;

15 a hollow piston rod connected to the piston and extending below the piston and slidably and sealingly through the first aperture in the bottom of the cylinder;

20 a reload chamber below the cylinder, the piston rod extending slidably and sealingly into the reload chamber and having a third passageway for liquid communicating with the reload chamber, the piston rod having a smaller area within the reload chamber upon which pressurized fluid in the reload chamber acts in a direction of movement of the piston and piston rod compared to said area of the piston;

25 a first one-way valve located in the third passageway which permits liquid to flow from the reload chamber into and above the piston rod and prevents liquid from flowing back through the piston rod into the reload chamber;

a fourth passageway for liquid extending from the reload chamber to a source of liquid to be pumped; and

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a second one-way valve in the fourth passageway which permits liquid to flow from the source of liquid into the reload chamber and prevents liquid from flowing from the reload chamber towards the source of liquid.

- 5 5. The apparatus of claim 4 wherein the means for pressurizing the volume of fluid includes a body of liquid.
6. The apparatus of claim 5, including a pump connected to the body of liquid for pumping liquid into the cylinder below the piston to raise the piston.
- 10 7. The apparatus of claim 6, wherein the pump is a centrifugal pump.
8. The apparatus of claim 7, including a sixth passageway for liquid adjacent to the bottom of the cylinder, a first conduit connecting the sixth passageway to the pump and a second conduit connecting the second passageway to the body of liquid.
- 15 9. The apparatus of claim 8, wherein the body of liquid is a receiver.
10. The apparatus of claim 9, including a pressure release valve adjacent to the second passageway in the second conduit.
- 20 11. A pumping apparatus for pumping fluid from a first source of fluid from a first location to a second location, the apparatus comprising:

25 a means for pumping the fluid from the first source of fluid including a piston, a cylinder and a source of pressurized fluid, the piston being reciprocatingly received in the cylinder, the pressurized fluid raising the piston in the cylinder during a pumping stroke thereby forming a volume of fluid in the cylinder under the piston, and the piston acting on the volume of fluid thereunder during a recovery stroke; and

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means for pressurizing the volume of fluid during the recovery stroke, whereby the pressurized volume of fluid can be converted to kinetic energy to assist in raising the piston on subsequent pumping strokes.